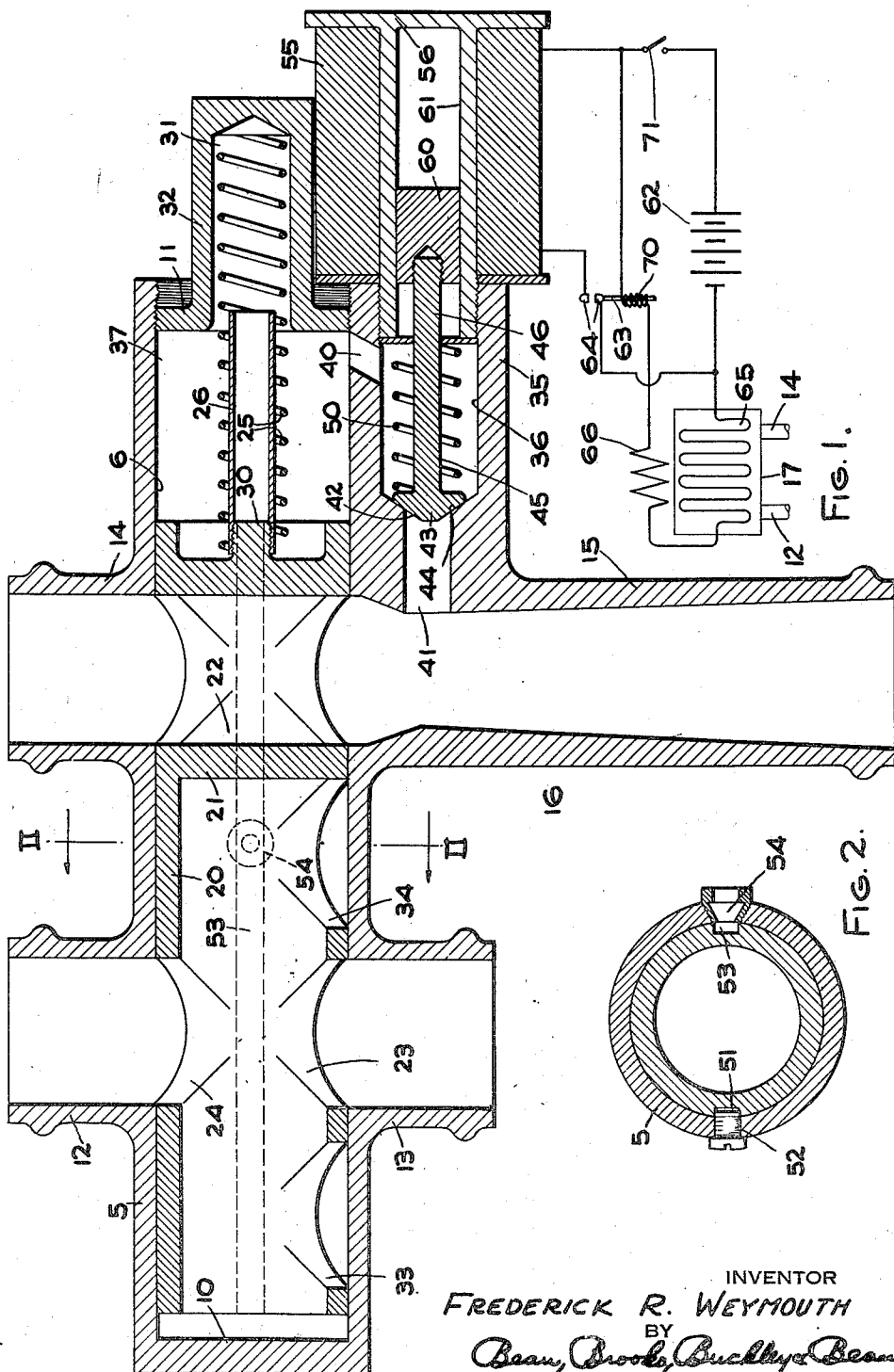


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F. R. WEYMOUTH
EMERGENCY BY-PASS SYSTEM

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INVENTOR
FREDERICK R. WEYMOUTH
BY
Bean, Brook, Buckeye & Bean
ATTORNEYS

UNITED STATES PATENT OFFICE

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EMERGENCY BY-PASS SYSTEM

Frederick R. Weymouth, Buffalo, N. Y., assignor
to Bell Aircraft Corporation, Wheatfield, N. Y.

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1

My invention relates in general to emergency by-pass systems and in particular to a system for use upon airplanes to by-pass a circulating liquid such as the engine lubricating oil or coolant for the engine, in the event of damage such as by gun fire to the radiator which is normally employed to cool such liquids.

The principal object of my invention has been to provide an improved device whereby upon damage to the radiator the liquid will be by-passed around such radiator, thereby assuring continued circulation of the liquid through the engine of the system, and at the same time avoiding loss of liquid.

Another object has been to provide a device for use in such systems which shall be automatic in operation.

Moreover, the device is small and compact in design and capable of continued service without attention.

The above objects and advantages have been accomplished by the device shown in the accompanying drawings, of which:

Fig. 1 is a longitudinal sectional view taken through the center line of the by-pass device, and including a diagram of the electrical connections; and

Fig. 2 is a transverse sectional view taken on line II—II of Fig. 1.

The device comprises a cylindrical casing 5 having a bore 6 extending throughout its length, and closed at one end by an integral wall 10 and at the opposite end by an end head 11, preferably screw-threaded into the end of the bore. The casing is provided with integral laterally extending sleeves 12 and 13 near one end thereof which are shown to lie coaxial and which provide means for attaching suitable conduits (not shown) for normally conveying liquid to various parts of the liquid circulating system. The sleeve 12 is preferably connected to the radiator for conducting liquid thereto, and the sleeve 13 is connected to the conduit which conveys heated liquid from the engine or other supply means (not shown). This pair of sleeves, therefore, provides a part of the supply passageways to the radiator. Arranged near the opposite end of the casing are two laterally extending sleeves 14 and 15. The sleeve 14 is adapted to be connected to the conduit conveying liquid returning from the radiator 17 of the system. The sleeve 15 is formed with a bore 16 of Venturi-shape, and liquid returning through the sleeve 14 is forced through the Venturi sleeve to be conducted thereby into any suitable connections leading to the pump intake or

2

storage tank of the system (not shown). The sleeves 14 and 15, therefore, form a part of the return passageways from the radiator.

Slidably mounted within the bore 6 of the casing is a hollow plunger valve 20 closed at one end by means of a laterally arranged cylindrical wall 21. This wall provides a lateral passageway 22 which is in registration with the sleeves 14 and 15 when the plunger valve is in its normal position as shown in Fig. 1. When in this position, heated liquid flowing from the engine or other supply means passes from sleeve 13 across passageways 23 and 24 in the valve 20 which then lie in registering positions with the sleeves 13 and 12, respectively; and thence out through sleeve 12 into the radiator supply conduit. The liquid when returning from the radiator, passes through sleeve 14, cylindrical wall 21, and thence through the Venturi bore 16 of sleeve 15 to the storage tank and/or pump from whence it is conducted again to the engine as required. The plunger valve 20 is maintained in the normal position shown by means of a helical spring 25 which is mounted about a spring guide 26 carried by a stud 30 formed on the end of the plunger valve and extending into the bore 31 of the cylindrical extension of the end head 11.

The plunger valve is adapted to move from its normal position as viewed in Fig. 1 to the right to interrupt the flow of fluid through sleeves 12 and 14 but to allow it to be conducted from sleeve 13 directly to sleeve 15. In order to accomplish this, passageways 33 and 34 are formed in the wall of the plunger valve and on each side of the passageway 23 thereof. The apertures 33 and 34 are so spaced that they will come into registering positions with the passageways of sleeves 13 and 15, respectively, when the plunger valve has been moved to the right in Fig. 1 and to its emergency position. When moved to this position it will be obvious that passageways 22 and 24 will be closed by the imperforated wall of the casing, thus preventing any of the fluid supplied to the valve from passing out through the sleeve 12.

A cylindrical boss 35 is arranged at one end of the casing 5 adjacent the sleeve 15 and it is formed with a liquid chamber 36. A passageway 40 is formed in the wall of the cylinder adjacent the head 11 whereby liquid communication may be had between the fluid chamber 36 and the space 37 in the cylinder between the end of the plunger and the head 11. A liquid passageway 41 is formed in the boss 35 and wall of the sleeve 15 opening up into the Venturi-shaped bore 16

thereof whereby liquid may pass from the bore of this sleeve to the liquid chamber 36. A valve 42 is mounted within the chamber having a head 43 for engagement with a seat 44 formed at the outer end of the passageway 41. This valve is also provided with a stem 45 which extends through a circular wall 46 formed at the end of the liquid chamber 36. A helical spring 50 mounted about the stem 45 bears against the head 43 of the valve 42 and also against the circular wall 46, whereby the valve head is kept normally pressed against its valve seat 44. When the passageway 41 is opened by the opening of the valve 42, as will hereinafter be described, a differential pressure will be created between the liquid contained in the space 37 of the casing and that flowing through the Venturi tube, causing a suction to be produced in the passageway 41. This suction will cause liquid to be drawn from the chamber 36 and from the space 37 through the port 40. Such differential pressure will cause the plunger valve 20 to be moved to the right from the position of Fig. 1 to its emergency position where passageways 22 and 24 will be cut off, as above pointed out; and the liquid will be caused to flow directly from sleeve 13 through the hollow plunger valve to sleeve 15, the passageway 23 being closed by the wall of the cylinder. Thus it will be understood that when the valve 20 is in its emergency position the liquid of the system will be by-passed relative to the radiator portion of the system while still permitting circulation of liquid through the engine of the system.

In order to keep the plunger valve 20 in such position that its openings will always be maintained in registrable positions with the coacting openings of the casing or cylinder, I provide this valve with a spline 51 with which a screw 52, carried by the casing engages. The valve 20 is also provided preferably at a point opposite the spline 51 with a longitudinal groove 53 for normally equalizing the pressure on both sides of the partition wall 21 of the valve. Formed in the casing and communicating with this groove is an air bleeder opening 54 which is connected by suitable means to the storage tank whereby air may be removed from the liquid as required to prevent "air locking."

A solenoid 55 serves to operate the valve 42. This solenoid is carried by a solenoid retainer 56 which is preferably attached to the boss 35 by being screw-threaded into the outer end thereof. Mounted within the retainer is a solenoid plunger 60 which is slidable within a suitable bore 61 formed therein. The plunger 60 is connected to the end of the valve stem 45, whereby the valve 42 will be drawn off from its seat when the solenoid is energized, thus initiating actuation of the plunger valve 20 to its emergency position.

In Fig. 1 I have shown in diagrammatic manner the electrical circuits and appliances for bringing about the operation of the solenoid. As herein illustrated, 62 represents a battery and 63 a relay having normally open contacts 64. The device is designed to be used in connection with the well known McLarren Screen 65 which comprises in effect a series conductor for electric current designed to be placed about or in the vicinity of the radiator of the system so that damage to the radiator will cause the screen to be broken thereby interrupting the circuit thereof. As shown in the drawings, this screen is connected in a circuit extending from the battery through a suitable resistor 66 and operating coil

70 of the relay through a switch 71. This switch 71 is designed so as to be closed when the motor or engine being served by the system is started. Current will then flow through the screen, resistor, and coil 70 of the relay causing its contacts 64 to be opened, in which position they will be normally maintained.

Should the radiator become damaged from any cause the McLarren Screen will also be damaged thus interrupting the circuit just above mentioned. With the interruption of current, the relay contact 64 will be closed, thus closing a circuit through the solenoid 55 and causing current to flow through the winding thereof. When the solenoid is energized, the solenoid plunger 60 will be drawn within the retainer, thus opening the valve 42. As above described, coolant flowing past the exposed end of the passageway 41 will draw fluid from such passageway thereby reducing the pressure in the space 37 and causing the valve 20 to be operated to its emergency position as above described.

It is obvious that, while I have shown and described but one form and application of the invention, some detailed modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. The combination with a radiator of an emergency radiator by-pass device, said device comprising a cylindrical casing, a plunger valve slidably mounted within said casing, said casing being formed with through inlet and through outlet passageways connected to the radiator inlet and outlet conduits respectively, said outlet passageway being of Venturi shape, said plunger valve being ported for normal communication with said through inlet passageway, said plunger valve being also ported for normal communication with said through outlet passageway, whereby cooling fluid will normally flow through said inlet passageway to said radiator, means for moving said plunger valve to close said through inlet and outlet passageways, said valve being formed with intercommunicating emergency openings for intercommunicating said through inlet and outlet passageways, while preventing flow of fluid therethrough to or from said radiator when said valve is in its emergency position, said valve moving means comprising a piston formed on one end of said valve, a cylinder formed on said casing for mounting said piston, spring means for maintaining said valve in normal position, valved passageways connecting the Venturi shaped portion of said outlet passageway with said cylinder to convey differential pressure forces therein operable to withdraw said plunger valve to move it to its emergency position, a port valve located in the last mentioned passageway to normally close the same, and emergency controlled means to unseat said port valve to cause said plunger valve to move to its emergency position.

2. In an emergency fluid by-pass system the combination with an electric conductor adapted to be broken upon being damaged, a relay having normally open contacts, and a source of electric energy connecting said conductor to said relay to hold said relay contacts in open position so long as said conductor is intact, an emergency fluid by-pass device, comprising a housing having a fluid inlet and a fluid outlet, a plunger valve mounted within said housing and adapted to be moved to emergency position to permit fluid to be by-passed therethrough under emergency

5

conditions, a fluid chamber formed at each end of said plunger valve, means for balancing the pressure in said chambers, the outlet of said housing being of Venturi shape, a normally closed fluid passageway connecting one of said chambers with said outlet, a solenoid port valve mounted in said passageway for opening the same under emergency conditions to create a differential pressure in said chambers to cause said plunger valve to be moved to its emergency position, whereby the fluid will be by-passed through said device, and means for operating said solenoid port valve comprising a circuit including in series a power source and the coil of said solenoid valve and the contacts of said relay, whereby upon disruption of said electric conductor said relay is deenergized and the contacts thereof close to complete the circuit energizing said solenoid coil to displace said port valve to open position.

3. In combination, a radiator and an emergency radiator by-pass device comprising a casing formed with through inlet and through outlet passageways connected to the radiator inlet and outlet conduits respectively, said outlet passageway being of Venturi shape, a plunger valve slidably mounted within said casing and ported for normal communication separately with said through inlet passageway and with said through outlet passageway whereby cooling fluid will normally flow through said inlet passageway to said radiator and thence back through said outlet passageway, means for moving said valve to emergency position to close said through inlet and outlet passageways, said valve being formed with another opening therethrough for intercommunicating when in emergency position said through inlet and outlet passageways while preventing flow of fluid therethrough to or from said radiator, said valve moving means comprising a piston formed on one end of said valve, a cylinder formed in said casing for mounting said piston, spring means for maintaining said valve in normal position, passageways connecting the Venturi shaped portion of said outlet passageway with said cylinder to convey differential pressure forces therein operable to withdraw said valve to move it to its emergency position, a port

6

valve located in the last mentioned passageway to normally close the same, and emergency controlled means to unseat said port valve to cause said valve to move to its emergency position.

4. In an emergency fluid by-pass system, the combination with an electric conductor adapted to be broken upon being damaged, and a source of electric energy connected to said conductor, an emergency fluid by-pass device comprising a housing having a fluid inlet and a fluid outlet, a plunger valve mounted within said housing and adapted to be moved to emergency position to permit fluid to be by-passed therethrough under emergency conditions, a fluid chamber formed at each end of said plunger valve, means for balancing the pressure in said chambers, the outlet of said housing being of Venturi shape, a normally closed fluid passageway connecting one of said chambers with said outlet, a solenoid port valve mounted in said passageway for opening the same under emergency conditions to create a differential pressure in said chambers to cause said plunger valve to be moved to its emergency position, whereby the fluid will be by-passed through said device, and means for operating said solenoid port valve comprising a circuit including in series a power source and the coil of said solenoid valve and said conductor, whereby upon disruption of said conductor said solenoid is energized to displace said port valve to open position.

FREDERICK R. WEYMOUTH.

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